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ABSTRACT

This presentation addresses three basic social issues generated by the computer revolution. The first section, "Money Matters," focuses on the economic effects of computer technology. These include the replacement of workers by fully automated machines, the threat to professionals posed by expanded access to specialized information, and the growing gap between the "haves" and the "have nots" that is a likely consequence of advances in information technology. The second section, "Who's in Charge?", addresses questions of control posed by advances in artificial intelligence and "ultra intelligent machines" (UIMs). Several possible approaches to controlling the development of such technology are discussed, along with the inherent limitations of such attempts at control. The final section extends this discussion into descriptions of personal encounters with machines, ranging from psychotherapy programs to the emotional effects of competing with computers in games. Finally, the potentially detrimental or beneficial effects of computer interaction on the development of children and adolescents are noted. (TE)

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"EXPLORING THE ISSUES: HUMANS AND COMPUTERS"*

by

Huber M. Walsh

As concerned citizens and teachers, it behooves us to be aware of and discuss the social issues generated by the computer revolution.

Along with some of you, I believe we are at the start of a computer revolution, that it is thrusting the world into a new era which some call the "Information Age." I see unlimited potential for good in this -- but the "social studies" part of me is concerned with the unresolved issues being touched off by the entry of computers into your lives and mine.

I will focus on three questions in my presentation. They are: (a) Why does money matter? (b) Who is in control? and (c) What IS a computer?

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MONEY MATTERS

To begin with, I invite you to consider the "money matters" -- that is, the economics side of society and computers. It is what many consider one of the most important issues in terms of its potential impact.

Work

We already see evidence of the economic impact of technology on society in the workplace. Not far from here, situated in Fenton and in Wentzville, Missouri, are two of the world's leading automated car manufacturing plants. One is producing General Motors cars, the other Chrysler products. Tour such a factory and you will see jobs formerly done by humans now being done by machines. The machines rarely make mistakes, never need a vacation or coffee break, and are unaffected by toxic paint fumes and indistrial hazards. Unlike their human predecessors, they can repeat the same routine jobs endlessly without tiring or becoming bored.

Despite the numbers of workers who are losing out to machines, we can expect the switch to automation to continue. It's a matter of simple economics. Business needs to be competitive and show profits to survive, and computers have clearly demonstrated their ability to serve these goals effectively.

Don't be too amazed a year or so from now when you walk into your favorite MacDonald's or Wendy's restaurant to be greeted by a robot. Peter Hughes has already designed the prototype humanoid creation to sell hamburgers for fast-food chain outlets. When not cooking or serving hamburgers, the robot zips around the place wiping up spills on the floor and table tops (1).

Two of the major problems faced by the fast-food chains are robberies and vandalism, and the robot is programmed to deal with these. Cash received by the automaton is sent down a chute into a burglarproof underground vault. When it detects acts of vandalism, an alarm is flashed to the police.

So far, only one robotized restaurant is planned, and restaurant operators are quick to assure everyone that massive unemployment in the industry won't be created. At any rate, says inventor Hughes,"... many of the teen-agers who now work at fast-food restaurants could find jobs in robot factories as other chains and retail stores turn to robotic employees.

Hughes is not alone in holding the bright hope of employing displaced workers in computer-related jobs. Many defenders of expanding the use of machines think automation

has taken a bum rap for swelling the ranks of the unemployed. They assert computers have created more jobs than they have terminated. This is partly true in the sense of creating computer-related jobs. The statistics are impressive: some predicting that by 1990 upwards of 20 per cent of the labor force will be employed in data processing jobs, and that 65 per cent of the labor force will be working in data processing-related jobs.

The implication is that workers displaced by machines will be retrained into these jobs, but in truth they often cannot or are not so retrained. Thus to say that computers have created more jobs than they have ended is apt to have a hollow ring to a displaced assembly line worker who has lost his job and is having trouble making ends meet.

Decline of the Professions

So far, professionals have been relatively safe from job displacement by machines, but if the predictions of Christopher Evans come true, that will change (2). He sees a time of eroding power of the professions resulting from expanded use of machines. It works like this. Professionals have traditionally acted as repositories and disseminators of their specialized knowledge. One contacts her lawyer when a will is needed, for instance.

Computers can be expected to change this, according to Evans, because programs will be available that make specialized information commonly available without needing to always consult the professional. Thus, given ordinary circumstances, one could make out his will on the computer.

Even now there is software available for home computers to help a person complete his or her income tax returns. These can be used with or without the assistance of a professional tax consultant.

Expanded access to specialized information, good though it may be for consumers, poses a threat to professionals in fields like law, medicine and education. "Once the barriers which stand between the average person and this knowledge dissolve," says Evans, "the significance of the profession dwindles and the power and status of its members shrink."

Professional applications of computers already exist in the form of systems designed to obtain medical case histories for doctors. These programs take satisfactory histories in a large variety of situations, make simple recommendations for further study, and offer tentative diagnoses.

Evidence shows that not only are patients more truthful when they are talking to a machine, but that the machines do their work so well that most of the patients interviewed by the computer preferred it to being interviewed by a doctor (3).

Time prohibits expanding upon some of the other implications for the professions which Evans suggests. To those of you who are intrigued by this topic, I commend his book.

Haves and Have Nots

Let's now turn to a different kind of economics issue relating to the "haves" and "have nots" of the computer age.

Society recognizes a person who cannot read is denied equal access to information and education.

In the Information Age, one who cannot interact with a computer will be denied access to information and ultimately to an equal education. Consequently, some experts are concerned that the computer will widen the gap between the rich and the poor.

The problem has potential implications for society at

large as a struggle between the computer literate and illerate -- the "know and the know nots." Indeed some observers are asking if we are in anger of creating a group of disadvantaged citizens who are the computer illerate.

Money matters in deciding who will and who will not have access to a computer -- which is as true for schools as well as for individuals.

Surveys show that the computer revolution is skipping over certain segments of our society. Overwhelmingly, whose who do purchase them are upper-middle-class white upwardly mobile males. By contrast, women, and blacks, are slower to purchase personal computers. In commenting on the results of this survey, the publisher of PC WORLD commented that "... personal computers [should not be] devices that increase the gap between male and female, black and white. It should be a great equalizer (4)."

According to a survey by Market Data Retrieval three years ago, 44 percent of the schools in wealthy districts had computers, compared to only 18 per cent in poorer districts (7). But even schools that can afford to buy computers have problems, for very few districts are able to purchase them in sufficient quantities to service the

needs of all their students adequately. Most educational programs are written for single student use, so to provide individualized learning with only one computer to the classroom or two or three computers to the school building requires a great deal of planning and organizing on the part of the teacher.

Beyond this, there are international dimensions to be considered as well. Some foresee technology creating an "electronic colonialism" through which technologically rich nations dominate those without access to the tools of the Information Age.

As you can see, when it comes to computers, money matters a great deal.

WHO'S IN CHARGE?

The super computers of the future will have the capacity to "think" -- that is, to constantly refine their intelligence by reprogramming themselves intrinsically. Some clues on the nature of these machines of the future are found in today's advanced chess-playing computers. The more games these machines play, the smarter they get because they literally learn from mistakes. When the computer makes "goof ups" and loses, it modifies its program to avoid that strategy in future games.

The power to grow smarter is what has some persons worried because it raises the spectre of ultra-intelligent machines (UIMs) intellectually outstripping humans at some point in their development. They will think better and faster than humans; consequently, some experts fear we will be in danger of losing control over the machines. To them, an Orwellian age of machines mastering man could become a future reality.

It's reminiscent of "HAL", the powerful computer aboard the space flight in "2001" that takes over and attempts to wreak its own destructive ends on the humans aboard.

For some elements of society, the temptation will be irresistible to misuse the power of UIMs. Criminals will

try to use them to outsmart law enforcement agencies and terrorists will regard them as effective weapons for international blackmail.

Control

One of the main issues, therefore, is control. Already one group of scientists has been formed for the purpose of overseeing developments in the field of artificial intelligence and, particularly, the development of UIMs. This body of experts meets periodically to discuss what's happening in these areas. It is unclear what they will do when they judge things have gone too far, but at least it can be said they are watching and talking.

Others, who thinks more specific action is in order, want limits established on the development of projects. Christopher Evans has several approaches.

First, development of UIMs might be restricted to work on the "safe" areas of a/i, while establishing taboos on obviously risky areas like weapons technology. Enforcement, however, could be a problem here since work on taboo machines could be carried on undetected at clandestine locations.

Second, work on a/i itself would be permitted, but development of UIMs capable of thinking and improving themselves to the point of being smarter than humans would be prohibited. Machines could be as smart as man, but not smarter. Clearly, there would always be temptation to push just a little farther, and consequently no assurance that the a/i UIM boundary would be preserved.

Third, put UIMs on a "short leash." That is, shackle them to their human creators so they would be effectively prevented from running away with themselves and gaining control of things. This seems to be the most workable approach.

Isaac Asimov's "Laws of Robotics" could be the core of such constraints. Law #1 holds that a robot cannot harm a human. Law #2, that a robot must obey all commands unless they interfere with the first law. And, law #3, that the robot must preserve itself unless doing so contradicts the first two. Consequently, a UIM could not harm humans, and is obligated to obey all human commands, including the one to destroy itself.

Do you find this has a far-off future fantasy air about it? It does seem so.

Yet, even now, persons question the safety of computers running our national missile defense systems, despite official assurances that adequate fail-safe procedures are in place.

But the situation merits our thought. I don't know how many of you saw the recent movie, "War Games." But those of you who did will recall how a bright young computer hacker taps into the nation's defense computers and triggers a terrifying "game" of thermonuclear war. Once the enormity of the teen-ager's act is recognized, desperate efforts are made to stop the machine. Eventually this is done, but not before this thinking computer nearly outsmarts wizards who are frantically trying to intervene before the missiles are launched.

PERSONAL ENCOUNTERS WITH MACHINES

When we go one-on-one with a computer, some very interesting illusions, perhaps even a fantasy, occur regarding what the computer "really" is. To the game player, the computer is a formidable opponent with the uncanny ability to win most of the time. To a teen-ager, the computer is a safe place -- a refuge providing escape from the trials and tribulations of the confusing adolescent world. To someone needing to get something "off his chest," a computer might be a friendly therapist providing sympathetic counsel. To the programmer who has just succeeded in getting her program to run properly, the computer is a source of wonder for all the amazing things it is capable of doing.

In the next part of my presentation, I would like to discuss some of these psychological aspects of computer usage.

"My Friend the Computer"

Picture someone seated before a computer. The computer and the person are having a conversation.

E: Hi, I'm Eliza, what's your problem?

U: I feel tired.

E: Tell me more about i:.

U: I'm not alert.

E: Did you come to me because you are not alert?

U: Yes.

etc.....

This may seem intelligent, but what is actually happening is that the machine is programmed to key in on certain words input by the user and respond in a certain way.

The program is the creation of a scientist, Joseph Weisenbaum, and its original purpose was to study the characteristics of human conversation with a machine.

But things more or less backfired on Weisenbaum, and the results left him horrified.

As it turned out, subjects became emotionally involved with ELIZA -- indeed they formed client-therapeutic relationships, and the focus of the experiment became psychotherapeutic instead of linguistic. "People who knew they were conversing with a machine soon forgot that fact, just as theatergoers....soon forget the action they are witnessing is not 'real'.

"...They would demand to be permitted to converse with the system in private and would, after conversing with it for a little time, insist, in spite of explanations, that the machine really understood them (5)."

Weizenbaum found this interaction astounding -- especially the extent to which extremely short exposures to his simple computer program induced powerful disillusional thinking in quite normal people. Since the experiment, he has become a strong opponent of using computers in areas he thinks should be the exclusive preserve of human social contact.

The surprising thing is that persons find the machine so friendly as a therapist -- as a matter of fact, some voice a preference for computer interaction over a human therapist because they do not find the computer cold and impersonal. They are quite comfortable in discussing very personal topics with it.

No one seriously suggests that machines, at this stage, can match the skills of a human in counselling clients, yet researchers like Charles and Warner Slack (8) discovered also that clients react quite favorably to their sessions with computers (6). This holds true on the campus as well. At the University of Illinois, Morton Wagman (7) found his "dilemma counselling" program worked well with students. Nine out of ten of them said the program had suggested worthwhile and practical solutions in the guidance it provided.

The problem with computer therapy is that not all problems one would want to work through can or should be approached on a machine. For the present, at least, a machine is still a machine, and it is, of course, limited by the program in what it can provide. Not everyone would find machine therapy beneficial -- indeed, in some cases clients might even be misled by it. So, despite the positive interaction some have experienced, cautions are in order. Who is using a therapeutic program and for what purposes deserves top consideration.

Hate and Competition

Besides evoking friendly responses in us, computers can also provide negative ones, like hate. More than one computer installation has been wrecked by a totally frustrated system operator going berserk, damaging terminals, attacking the machine itself, and destroying priceless data in the process.

The frequency of such outbursts of rage has prompted computer companies to investigate what triggers these episodes of violence and what can be done to prevent them.

Less brutal, but sometimes unfriendly in nature, are the competitive human responses developing between player and

machine during a game. The psychologists, Scheibe and Erwin, studied this effect (8).

Students played a series of games and their comments were tape recorded. The researchers discovered that 98 per cent of the players PERSONIFIED the machine in some way in their spontaneous remarks. The computer was commonly referred to as "it," "he," "you," and "they." Interestingly, "she" was not used.

Comments like "It's just waiting to GET me" and "It's got a little mind" are indicative of the competitiveness of the encounter. Use of profanity was common.

Profanity, in fact, is fairly universal in computer usage, and has produced some strange outcomes. For instance, one university has programmed machines to recognize some common swear words, and when it detects one, the machine stops processing and demands an apology from the user. If it doesn't get one, it promptly shuts down.

Safe Places

Sherry Turkle is an associate professor at MIT, whose studies on computers and the human spirit, are shedding new light on children's interactions with computers. Her latest book is The Second Self (9).

In one section of the book, she describes the "mastery state" which roughly coincides with the pre-adolescent years.

In mastery, the young person attains great proficiency in some skill or activity. Achieving a mastery state helps children cope with the complexities of the pre-adolesence world. Self concept is enhanced through the knowledge there is something one succeeds at. The mastery activities are something into which one becomes totally immersed, making it possible to shut out the agonies of the outside world. The mastery state activity provides a "safe place" for the child.

Many children today find their mastery experience working with computers -- be it something like becoming an expert game player or a virtuoso programmer. Young persons respond to the challenge of the computer, and in the process experience a kind of seductive holding power. Turkle explains both children and adults have always had "safe places," but the safe place provided by a computer is unique in its seductiveness and holding power.

This is when the child disappears into his room to be alone with the computer, emerging into the outer world only for food or other basic essentials. Parents may

become alarmed at this point. They want their children to know about computers, but they fear that the social isolation may be harmful.

Fears may be justified, but not always. Some degree of isolation, in the end, can result in improved socialization. The case of Henry is illustrative.

In junior high, Henry's intense interest in technology led him to develop a great deal of expertise in repairing air conditioners. But, his mastery of this technology led to a social dead end -- after all, how many 8th and 9th graders want to discuss the finer points of refrigeration? Henry was a social isolate.

Then, he became fascinated with computers and applied his interest in technology to these machines. As Henry explored his new mastery area, word of his expertise spread among the other students. Soon, they were calling on him for assistance in solving their problems. Through this avenue Henry was able to reach out and make effective social contacts with others.

These are some of the issues of which we now are aware. Future developments are bound to expand the list. We face many unanswered questions, including the overarching

question: Who will control the machines? Clearly, this is the time to begin dialogs focused on becoming aware of problems and finding their solutions.

Notes

1. "Robots Will Be Serving Hamburgers," St. Louis Post-Dispatch, April 1, 1985.

2. Evans, Christopher. The Micro Millennnium. New York: Viking Press, 1979.

3. Evans, op. cit. pp 112-14.

4. Scharge, Michael, "Women, Blacks Slow to Buy Personal Computers." St. Louis Globe-Democrat, July 31, 1984.

5. Fruede, Neil. The Intimate Machine: Close Encounters with Computers and Robots. New York: New American Library, 1983, pp 83-4.

6. Fruede, op. cit. pp 84-5.

7. Fruede, op. cit. pp 86-7.

8. Fruede, op. cit. pp 68-9.

9. Turkle, Sherry. The Second Self: Computers and the Human Spirit. New York: Somon and Schuster, 1984.